

116TH CONGRESS
1ST SESSION

S. 2332

To provide for the modernization of the electric grid, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JULY 30, 2019

Ms. CANTWELL (for herself, Mr. HEINRICH, and Ms. HIRONO) introduced the following bill; which was read twice and referred to the Committee on Energy and Natural Resources

A BILL

To provide for the modernization of the electric grid, and
for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE; TABLE OF CONTENTS.**

4 (a) SHORT TITLE.—This Act may be cited as the
5 “Grid Modernization Act of 2019”.

6 (b) TABLE OF CONTENTS.—The table of contents for
7 this Act is as follows:

- Sec. 1. Short title; table of contents.
- Sec. 2. Definitions.
- Sec. 3. Grid storage program.
- Sec. 4. Technology demonstration on the distribution system.
- Sec. 5. Micro-grid and hybrid micro-grid systems program.
- Sec. 6. Electric grid architecture, scenario development, and modeling.
- Sec. 7. Voluntary model pathways.

Sec. 8. Performance metrics for electricity infrastructure providers.
 Sec. 9. Voluntary State, regional, and local electricity distribution planning.
 Sec. 10. Authorization of appropriations.

1 **SEC. 2. DEFINITIONS.**

2 In this Act:

3 (1) DEPARTMENT.—The term “Department”
 4 means the Department of Energy.

5 (2) NATIONAL LABORATORY.—The term “Na-
 6 tional Laboratory” has the meaning given the term
 7 in section 2 of the Energy Policy Act of 2005 (42
 8 U.S.C. 15801).

9 (3) SECRETARY.—The term “Secretary” means
 10 the Secretary of Energy.

11 **SEC. 3. GRID STORAGE PROGRAM.**

12 (a) IN GENERAL.—The Secretary shall conduct a
 13 program of research, development, and demonstration of
 14 electric grid energy storage that addresses the principal
 15 challenges identified in the 2013 Department of Energy
 16 Strategic Plan for Grid Energy Storage.

17 (b) AREAS OF FOCUS.—The program under this sec-
 18 tion shall focus on—

19 (1) materials, electric thermal, electromechani-
 20 cal, and electrochemical systems research;

21 (2) power conversion technologies research;

22 (3) developing—

23 (A) empirical and science-based industry
 24 standards to compare the storage capacity,

1 cycle length and capabilities, and reliability of
2 different types of electricity storage; and

3 (B) validation and testing techniques;

4 (4) other fundamental and applied research
5 critical to widespread deployment of electricity stor-
6 age;

7 (5) device development that builds on results
8 from research described in paragraphs (1), (2), and
9 (4), including combinations of power electronics, ad-
10 vanced optimizing controls, and energy storage as a
11 general purpose element of the electric grid;

12 (6) grid-scale testing and analysis of storage
13 devices, including test-beds and field trials;

14 (7) cost-benefit analyses that inform capital ex-
15 penditure planning for regulators and owners and
16 operators of components of the electric grid;

17 (8) electricity storage device safety and reli-
18 ability, including potential failure modes, mitigation
19 measures, and operational guidelines;

20 (9) standards for storage device performance,
21 control interface, grid interconnection, and inter-
22 operability; and

23 (10) maintaining a public database of energy
24 storage projects, policies, codes, standards, and reg-
25 ulations.

1 (c) ASSISTANCE TO STATES.—The Secretary may
2 provide technical and financial assistance to States, Indian
3 Tribes, or units of local government to participate in or
4 use research, development, or demonstration of technology
5 developed under this section.

6 (d) AUTHORIZATION OF APPROPRIATIONS.—There is
7 authorized to be appropriated to the Secretary to carry
8 out this section \$50,000,000 for each of fiscal years 2020
9 through 2028.

10 (e) NO EFFECT ON OTHER PROVISIONS OF LAW.—
11 Nothing in this Act or an amendment made by this Act
12 authorizes regulatory actions that would duplicate or con-
13 flict with regulatory requirements, mandatory standards,
14 or related processes under section 215 of the Federal
15 Power Act (16 U.S.C. 824o).

16 (f) USE OF FUNDS.—To the maximum extent prac-
17 ticable, in carrying out this section, the Secretary shall
18 ensure that the use of funds to carry out this section is
19 coordinated among different offices within the Grid Mod-
20 ernization Initiative of the Department and other pro-
21 grams conducting energy storage research.

22 **SEC. 4. TECHNOLOGY DEMONSTRATION ON THE DISTRIBUTION SYSTEM.**
23

24 (a) IN GENERAL.—The Secretary shall establish a
25 grant program to carry out eligible projects related to the

1 modernization of the electric grid, including the applica-
2 tion of technologies to improve observability, advanced
3 controls, and prediction of system performance on the dis-
4 tribution system.

5 (b) ELIGIBLE PROJECTS.—To be eligible for a grant
6 under subsection (a), a project shall—

7 (1) be designed to improve the performance and
8 efficiency of the future electric grid, while ensuring
9 the continued provision of safe, secure, reliable, and
10 affordable power;

11 (2) demonstrate—

12 (A) secure integration and management of
13 two or more energy resources, including distrib-
14 uted energy generation, combined heat and
15 power, micro-grids, energy storage, electric ve-
16 hicles, energy efficiency, demand response, and
17 intelligent loads; and

18 (B) secure integration and interoperability
19 of communications and information tech-
20 nologies; and

21 (3) be subject to the requirements of section
22 545(a) of the Energy Security and Independence Act
23 of 2007 (42 U.S.C. 17155(a)).

1 **SEC. 5. MICRO-GRID AND HYBRID MICRO-GRID SYSTEMS**

2 **PROGRAM.**

3 (a) DEFINITIONS.—In this section:

4 (1) HYBRID MICRO-GRID SYSTEM.—The term
5 “hybrid micro-grid system” means a stand-alone
6 electrical system that—

7 (A) is comprised of conventional generation
8 and at least 1 alternative energy resource; and

9 (B) may use grid-scale energy storage.

10 (2) ISOLATED COMMUNITY.—The term “iso-
11 lated community” means a community that is pow-
12 ered by a stand-alone electric generation and dis-
13 tribution system without the economic and reliability
14 benefits of connection to a regional electric grid.

15 (3) MICRO-GRID SYSTEM.—The term “micro-
16 grid system” means a standalone electrical system
17 that uses grid-scale energy storage.

18 (4) STRATEGY.—The term “strategy” means
19 the strategy developed pursuant to subsection
20 (b)(2)(B).

21 (b) PROGRAM.—

22 (1) ESTABLISHMENT.—The Secretary shall es-
23 tablish a program to promote the development of—

24 (A) hybrid micro-grid systems for isolated
25 communities; and

1 (B) micro-grid systems to increase the re-
 2 silience of critical infrastructure.

3 (2) PHASES.—The program established under
 4 paragraph (1) shall be divided into the following
 5 phases:

6 (A) Phase I, which shall consist of the de-
 7 velopment of a feasibility assessment for—

8 (i) hybrid micro-grid systems in iso-
 9 lated communities; and

10 (ii) micro-grid systems to enhance the
 11 resilience of critical infrastructure.

12 (B) Phase II, which shall consist of the de-
 13 velopment of an implementation strategy, in ac-
 14 cordance with paragraph (3), to promote the
 15 development of hybrid micro-grid systems for
 16 isolated communities, particularly for those
 17 communities exposed to extreme weather condi-
 18 tions and high energy costs, including elec-
 19 tricity, space heating and cooling, and transpor-
 20 tation.

21 (C) Phase III, which shall be carried out
 22 in parallel with Phase II and consist of the de-
 23 velopment of an implementation strategy to
 24 promote the development of micro-grid systems

1 that increase the resilience of critical infrastruc-
2 ture.

3 (D) Phase IV, which shall consist of cost-
4 shared demonstration projects, based upon the
5 strategies developed under subparagraph (B)
6 that include the development of physical and cy-
7 bersecurity plans to take appropriate measures
8 to protect and secure the electric grid.

9 (E) Phase V, which shall establish a bene-
10 fits analysis plan to help inform regulators, pol-
11 icymakers, and industry stakeholders about the
12 affordability, environmental and resilience bene-
13 fits associated with Phases II, III, and IV.

14 (3) REQUIREMENTS FOR STRATEGY.—In devel-
15 oping the strategy under paragraph (2)(B), the Sec-
16 retary shall consider—

17 (A) establishing future targets for the eco-
18 nomic displacement of conventional generation
19 using hybrid micro-grid systems, including dis-
20 placement of conventional generation used for
21 electric power generation, heating and cooling,
22 and transportation;

23 (B) the potential for renewable resources,
24 including wind, solar, and hydropower, to be in-
25 tegrated into a hybrid micro-grid system;

1 (C) opportunities for improving the effi-
2 ciency of existing hybrid micro-grid systems;

3 (D) the capacity of the local workforce to
4 operate, maintain, and repair a hybrid micro-
5 grid system;

6 (E) opportunities to develop the capacity of
7 the local workforce to operate, maintain, and
8 repair a hybrid micro-grid system;

9 (F) leveraging existing capacity within
10 local or regional research organizations, such as
11 organizations based at institutions of higher
12 education, to support development of hybrid
13 micro-grid systems, including by testing novel
14 components and systems prior to field deploy-
15 ment;

16 (G) the need for basic infrastructure to de-
17 velop, deploy, and sustain a hybrid micro-grid
18 system;

19 (H) input of traditional knowledge from
20 local leaders of isolated communities in the de-
21 velopment of a hybrid micro-grid system;

22 (I) the impact of hybrid micro-grid systems
23 on defense, homeland security, economic devel-
24 opment, and environmental interests;

1 (J) opportunities to leverage existing inter-
 2 agency coordination efforts and recommenda-
 3 tions for new interagency coordination efforts to
 4 minimize unnecessary overhead, mobilization,
 5 and other project costs; and

6 (K) any other criteria the Secretary deter-
 7 mines appropriate.

8 (c) COLLABORATION.—The program established
 9 under subsection (b)(1) shall be carried out in collabora-
 10 tion with relevant stakeholders, including, as appro-
 11 priate—

- 12 (1) States;
- 13 (2) Indian Tribes;
- 14 (3) regional entities and regulators;
- 15 (4) units of local government;
- 16 (5) institutions of higher education; and
- 17 (6) private sector entities.

18 (d) REPORT.—Not later than 180 days after the date
 19 of enactment of this Act, and annually thereafter until cal-
 20 endar year 2029, the Secretary shall submit to the Com-
 21 mittee on Energy and Natural Resources of the Senate
 22 and the Committee on Energy and Commerce of the
 23 House of Representatives a report on the efforts to imple-
 24 ment the program established under subsection (b)(1) and

1 the status of the strategy developed under subsection
2 (b)(2)(B).

3 **SEC. 6. ELECTRIC GRID ARCHITECTURE, SCENARIO DEVELOP-**
4 **MENT, AND MODELING.**

5 (a) GRID ARCHITECTURE AND SCENARIO DEVELOP-
6 MENT.—

7 (1) IN GENERAL.—Subject to paragraph (2),
8 the Secretary shall establish and facilitate a collabo-
9 rative process to develop model grid architecture and
10 a set of future scenarios for the electric grid to ex-
11 amine the impacts of different combinations of re-
12 sources (including different quantities of distributed
13 energy resources and large-scale, central generation)
14 on the electric grid.

15 (2) MARKET STRUCTURE.—The grid architec-
16 ture and scenarios developed under paragraph (1)
17 shall account for differences in market structure, in-
18 cluding an examination of the potential for stranded
19 costs in each type of market structure.

20 (3) FINDINGS.—Based on the findings of grid
21 architecture developed under paragraph (1), the Sec-
22 retary shall—

23 (A) determine whether any additional
24 standards are necessary to ensure the interoper-

1 ability of grid systems and associated commu-
2 nications networks; and

3 (B) if the Secretary makes a determination
4 that additional standards are necessary under
5 subparagraph (A), make recommendations for
6 additional standards, including, as may be ap-
7 propriate, to the Electric Reliability Organiza-
8 tion under section 215 of the Federal Power
9 Act (16 U.S.C. 824o). The Electric Reliability
10 Organization shall not be under any obligation
11 to establish any process to consider such rec-
12 ommendations.

13 (b) MODELING.—Subject to subsection (c), the Sec-
14 retary shall—

15 (1) conduct modeling based on the scenarios de-
16 veloped under subsection (a); and

17 (2) analyze and evaluate the technical and fi-
18 nancial impacts of the models to assist States, utili-
19 ties, and other stakeholders in—

20 (A) enhancing strategic planning efforts;

21 (B) avoiding stranded costs; and

22 (C) maximizing the cost-effectiveness of fu-
23 ture grid-related investments.

24 (c) INPUT.—The Secretary shall develop the sce-
25 narios and conduct the modeling and analysis under sub-

1 sections (a) and (b) with participation or input, as appro-
 2 priate, from—

3 (1) the National Laboratories;

4 (2) States;

5 (3) State regulatory authorities;

6 (4) transmission organizations;

7 (5) representatives of all sectors of the electric
 8 power industry;

9 (6) academic institutions;

10 (7) independent research institutes; and

11 (8) other entities.

12 (d) EFFECT.—Nothing in this section grants any per-
 13 son a right to receive or review confidential, proprietary,
 14 or otherwise protected information concerning grid archi-
 15 tecture or scenarios.

16 **SEC. 7. VOLUNTARY MODEL PATHWAYS.**

17 (a) ESTABLISHMENT OF VOLUNTARY MODEL PATH-
 18 WAYS.—

19 (1) ESTABLISHMENT.—Not later than 90 days
 20 after the date of enactment of this Act, the Sec-
 21 retary, in consultation with the steering committee
 22 established under paragraph (3), shall initiate the
 23 development of voluntary model pathways for mod-
 24 ernizing the electric grid through a collaborative,
 25 public-private effort that—

1 (A) produces illustrative policy pathways
2 encompassing a diverse range of technologies
3 that can be adapted for State and regional ap-
4 plications by regulators and policymakers;

5 (B) facilitates the modernization of the
6 electric grid and associated communications
7 networks to achieve the objectives described in
8 paragraph (2);

9 (C) ensures a reliable, resilient, affordable,
10 safe, and secure electric grid; and

11 (D) acknowledges and accounts for dif-
12 ferent priorities, electric systems, and rate
13 structures across States and regions.

14 (2) OBJECTIVES.—The pathways established
15 under paragraph (1) shall facilitate achievement of
16 as many of the following objectives as practicable:

17 (A) Near real-time situational awareness of
18 the electric system.

19 (B) Data visualization.

20 (C) Advanced monitoring and control of
21 the advanced electric grid.

22 (D) Enhanced certainty of policies for in-
23 vestment in the electric grid.

24 (E) Increased innovation.

25 (F) Greater consumer empowerment.

1 (G) Enhanced grid resilience, reliability,
2 and robustness.

3 (H) Improved—

4 (i) integration of distributed energy
5 resources;

6 (ii) interoperability of the electric sys-
7 tem; and

8 (iii) predictive modeling and capacity
9 forecasting.

10 (I) Reduced cost of service for consumers.

11 (J) Diversification of generation sources.

12 (3) STEERING COMMITTEE.—Not later than 90
13 days after the date of enactment of this Act, the
14 Secretary shall establish a steering committee to
15 help develop the pathways under paragraph (1), to
16 be composed of members appointed by the Secretary,
17 consisting of persons with appropriate expertise rep-
18 resenting a diverse range of interests in the public,
19 private, and academic sectors, including representa-
20 tives of—

21 (A) the Federal Energy Regulatory Com-
22 mission;

23 (B) the National Laboratories;

24 (C) States;

25 (D) State regulatory authorities;

- 1 (E) transmission organizations;
- 2 (F) representatives of all sectors of the
- 3 electric power industry;
- 4 (G) institutions of higher education;
- 5 (H) independent research institutes; and
- 6 (I) other entities.

7 (b) TECHNICAL ASSISTANCE.—The Secretary may
 8 provide technical assistance to States, Indian Tribes, or
 9 units of local government to adopt or implement one or
 10 more elements of the pathways developed under subsection
 11 (a)(1), including on a pilot basis.

12 **SEC. 8. PERFORMANCE METRICS FOR ELECTRICITY INFRA-**
 13 **STRUCTURE PROVIDERS.**

14 (a) IN GENERAL.—Not later than 2 years after the
 15 date of enactment of this Act, the Secretary, in consulta-
 16 tion with the steering committee established under section
 17 7(a)(3), shall submit to the Committee on Energy and
 18 Natural Resources of the Senate and the Committee on
 19 Energy and Commerce of the House of Representatives
 20 a report that includes—

- 21 (1) an evaluation of the performance of the
- 22 electric grid as of the date of the report; and
- 23 (2) a description of the projected range of
- 24 measurable costs and benefits associated with the

1 changes evaluated under the scenarios developed
2 under section 6.

3 (b) CONSIDERATIONS FOR DEVELOPMENT OF
4 METRICS.—In developing metrics for the evaluation and
5 projections under subsection (a), the Secretary shall con-
6 sider—

7 (1) standard methodologies for calculating im-
8 provements or deteriorations in the performance
9 metrics, such as reliability, grid efficiency, power
10 quality, consumer satisfaction, sustainability, and fi-
11 nancial incentives;

12 (2) standard methodologies for calculating po-
13 tential costs and measurable benefits value to rate-
14 payers, applying the performance metrics developed
15 under paragraph (1);

16 (3) identification of tools, resources, and de-
17 ployment models that may enable improved perform-
18 ance through the adoption of emerging, commer-
19 cially available or advanced grid technologies or solu-
20 tions, including—

21 (A) multicustomer micro-grids;

22 (B) distributed energy resources;

23 (C) energy storage;

24 (D) electric vehicles;

25 (E) electric vehicle charging infrastructure;

1 (F) integrated information and commu-
 2 nications systems;

3 (G) transactive energy systems; and

4 (H) advanced demand management sys-
 5 tems; and

6 (4) the role of States and local regulatory au-
 7 thorities in enabling a robust future electric grid to
 8 ensure that—

9 (A) electric utilities remain financially via-
 10 ble;

11 (B) electric utilities make the needed in-
 12 vestments that ensure a reliable, secure, and re-
 13 silient grid; and

14 (C) costs incurred to transform to an inte-
 15 grated grid are allocated and recovered respon-
 16 sibly, efficiently, and equitably.

17 **SEC. 9. VOLUNTARY STATE, REGIONAL, AND LOCAL ELEC-**
 18 **TRICITY DISTRIBUTION PLANNING.**

19 (a) IN GENERAL.—On the request of a State, re-
 20 gional organization, or electric utility, the Secretary shall
 21 provide assistance to States, regional organizations, and
 22 electric utilities to facilitate the development of State, re-
 23 gional, and local electricity distribution plans by—

1 (1) conducting a resource assessment and anal-
 2 ysis of future demand and distribution requirements;
 3 and

4 (2) developing open source tools for State, re-
 5 gional, and local planning and operations.

6 (b) RISK AND SECURITY ANALYSIS.—The assessment
 7 under subsection (a)(1) shall include—

8 (1) the evaluation of the physical security, cy-
 9 bersecurity, and associated communications needs of
 10 an advanced distribution management system and
 11 the integration of distributed energy resources; and

12 (2) advanced use of grid architecture to analyze
 13 risks in an all-hazards approach that includes com-
 14 munications infrastructure, control systems architec-
 15 ture, and power systems architecture.

16 (c) DESIGNATION.—The information collected for the
 17 assessment and analysis under subsection (a)(1)—

18 (1) shall be considered to be critical electric in-
 19 frastructure information under section 215A of the
 20 Federal Power Act (16 U.S.C. 824o–1); and

21 (2) shall only be released in compliance with
 22 regulations implementing that section.

23 (d) TECHNICAL ASSISTANCE.—For the purpose of
 24 assisting in the development of State and regional elec-

1 tricity distribution plans, the Secretary shall provide tech-
 2 nical assistance to—

3 (1) States;

4 (2) regional reliability entities; and

5 (3) other distribution asset owners and opera-
 6 tors.

7 (e) WITHDRAWAL.—A State or any entity that has
 8 requested technical assistance under this section may
 9 withdraw the request for technical assistance at any time,
 10 and on such withdrawal, the Secretary shall terminate all
 11 assistance efforts.

12 (f) EFFECT.—Nothing in this section authorizes the
 13 Secretary to require any State, regional organization, re-
 14 gional reliability entity, asset owner, or asset operator to
 15 adopt any model, tool, plan, analysis, or assessment.

16 **SEC. 10. AUTHORIZATION OF APPROPRIATIONS.**

17 There is authorized to be appropriated to the Sec-
 18 retary to carry out section 4 through this section
 19 \$200,000,000 for each of fiscal years 2020 through 2028.

○